cbecimat26
26° Congresso Brasileiro de Engenharia e Ciência dos Materiais
22 a 26 de novembro de 2026
Costão do Santinho
Florianópolis-SC

DEVELOPMENT AND VALIDATION OF A REAL-PROCESS TORQUE RHEOMETRY SYSTEM FOR POLYMER EXTRUSION

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Introduction

Polymer extrusion is influenced by the rheological properties of materials and processing conditions. However, real-time monitoring of these properties remains a challenge. In this context, operational variables can provide indicators of the mechanical stress during extrusion, allowing the assessment of material behavior under different processing conditions.

Objectives

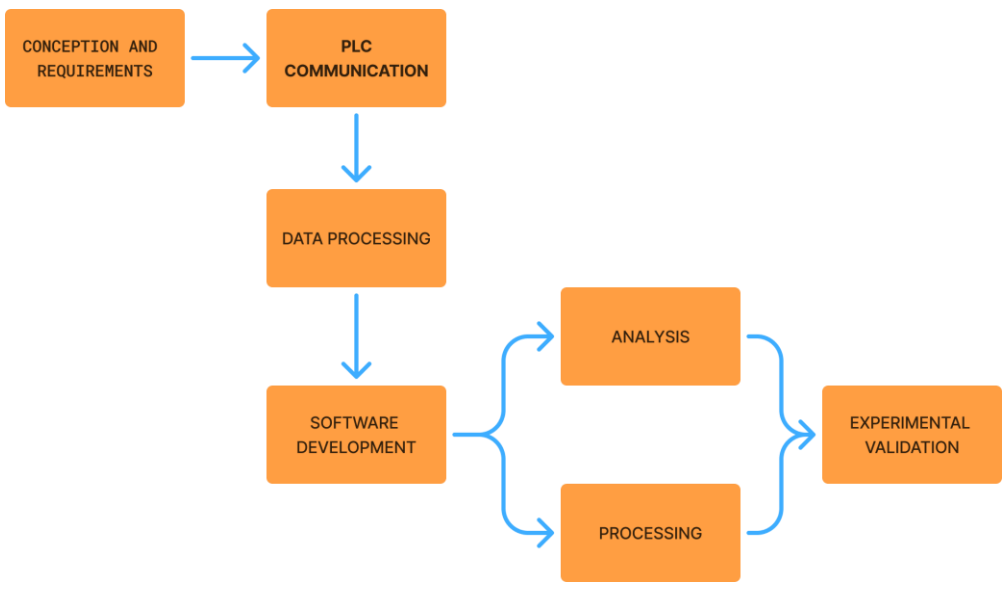


Figure 1. Flowchart of the main tool development stages.

Methodology

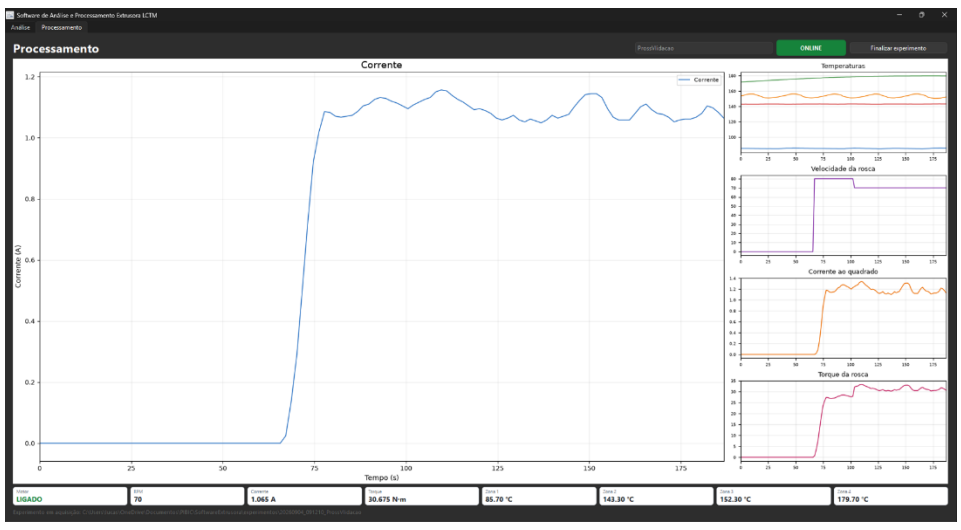


Figure 2. Software interface for real-time monitoring of extrusion process variables.

Results and Discussion

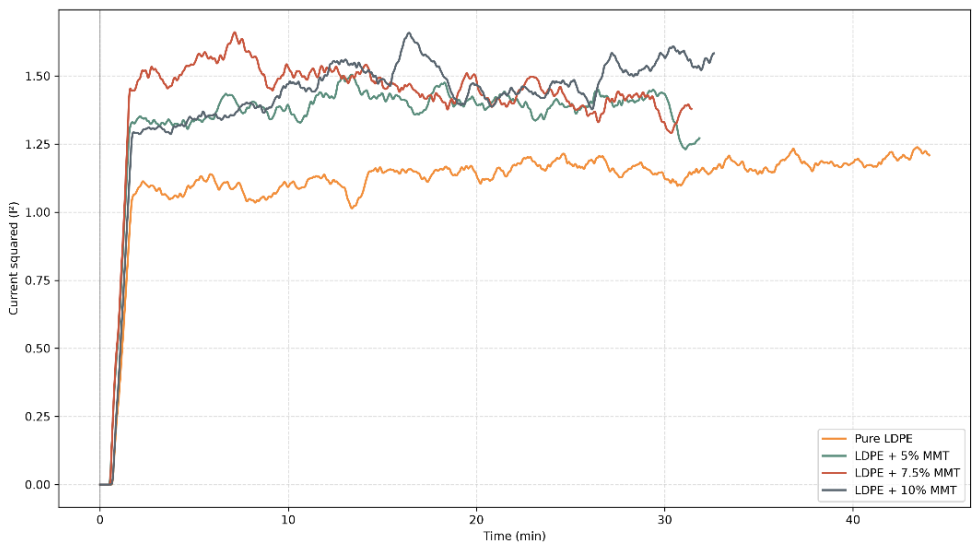


Figure 3. Comparison of squared current (I^2) curves obtained during the extrusion of low-density polyethylene (LDPE) containing different concentrations of EU/MMT-NPZnO nanocomposite.

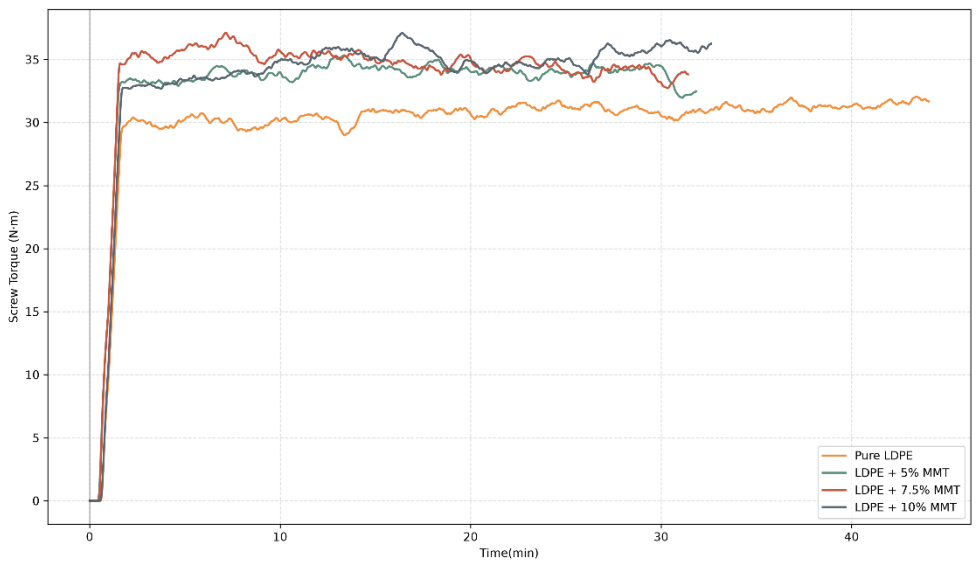


Figure 4. Comparison of torque curves obtained during the extrusion of low-density polyethylene (LDPE) containing different concentrations of EU/MMT-NPZnO nanocomposite.

Conclusions

The developed tool demonstrates strong potential for monitoring material behavior under real processing conditions and supporting the adjustment of extrusion operational parameters. As future steps, we propose integrating a load cell for direct torque measurement, as well as benchmarking the results against reference methods, such as torque rheometers, to validate the estimates obtained from the electrical current and establish a robust quantitative correlation between the measurements.

References and Acknowledgments

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